9.0 AIRPLANE SPECIFIC TIMETABLE RECOMMENDATIONS FOR COMPLETION OF AUDIT

9.1 AIRPLANE FLEETS AT RISK

The scope of this WFD structural evaluation has been expanded from the initial eleven (11) Aging Fleet models identified in the AAWG Final Report on Structural Fatigue Evaluation dated October 14, 1993 (Reference [3]). It now includes all large transport category airplanes having a maximum take-off gross weight (MTOGW) greater than 75,000 lbs., which have been certified to pre-or post-Amendment 45 standards.

In order to ensure that the WFD evaluation is completed in a timely manner with respect to the actual service life accumulated to-date, the following fleet selection criterion has been established based on the Design Service Goal (DSG) or the Extended Service Goal (ESG):

WFD Evaluation Priority

Category	Fleet Status	Required Action
A	> 100% DSG or ESG	Expedite WFD program implementation by Dec 31, 2001 See Section 10
B	> 75% DSG or ESG	WFD program development should have begun
C	> 50% DSG or ESG	Initiate preliminary planning for WFD program development

Any fleet status below 50% DSG/ESG does not require action at this time. The number of airplanes in each priority category is documented in Tables 9.1and 9.2, to assist in prioritizing industry action.

These tables list passenger and freighter airplanes in chronological order of certification date, relating to pre- and post-amendment 45 status. However, they exclude Russian and Japanese airplanes and other models having fewer than ten airplanes in commercial service. Values of MTOGW are also integrated into these tables for the respective fleet types as well as the current number of airplanes in service.

Table 9.1 Large Transport Category Airplanes Certified Pre-Amendment 45

AIRPLANE	Initial Certification Information			Number in Service	DSG 1000 LDGS	ESG 1000 LDGS	WFD* Audit Completion Date	Number of Airplanes In Each Category			Models
	CERT DATE	PAX	MTOGW 1000lb.					A >100% D/ESG	B >75% D/ESG	C >50% D/ESG	
L188	Aug-53	74	116	39	N/A	N/A	NP	?	?	?	Electra
B707	Sep-58	174	280	197	20	N/A	12-31-01	110	179	179	-100,-300
DC8	Aug-59	139	276	300	25	70	12-31-01	0	17	103	-10,-20,-30,-40,-50,-50F,-60,-60F,-70, -70F
B720	Jun-60	149	230	11	30	N/A	12-31-01	4	9	10	720,720B
B727	Dec-63	125	161	1525	60	N/A	12-31-01	24	474	1060	-100,-100C,-200,-200F
BAC111	Apr-65	99	104	106	55	85	NP	0	10	43	
DC9	Nov-65	90	79	862	40	100	12-31-01	4	198	600	-10,-10F,-20,-30,-30F,-40,-50
B737	Dec-67	99	98	1021	75	N/A	12-31-01	31	233	528	-100,-200,-200C
F28	Feb-69	55	65	204	60	90	12-31-01	0	13	56	
B747	Dec-69	450	713	1048	20	N/A	12-31-01	96	243	491	-100,-200
DC10	Jul-71	270	430	413	42	N/A	12-31-01	3	52	241	-10,-30,-30F,-40
L1011	Apr-72	400	474	214	36	N/A	12-31-01	4	33	136	-1, -14, -15, -3
A300	Mar-74	345	301	230	48/40/34	N/A	12-31-03	0	13	76	B2, B4-100, B4-200
Concorde	Jan-76	100	407	13	6.7	8.5	NP	0	5	2	
MD80	Aug-80	155	140	1145	50	N/A	NP	0	47	217	-81,-82,-83,-87,-88
B747	Mar 83	450	833	471	20	N/A	NP	0	0	467	-300, -400
B737	Nov 84	159	140	1880	75	N/A	NP	0	0	21	-300, -400, -500
A300#	Jun 86	345	363	213	30	N/A	12-31-03	0	2	16	-600, -600R, -F4-605

- Certified pre Am 45, Analysis to Post Am 45 Standards
* Program ready to be incorporated into operators maintenance programs. Programs currently under development are voluntary OEM Programs.
NP — None Planned at this time

Table 9.2 Large Transport Category Airplanes Certified Post Amendment 45

AIRPLANE	Initial Certification Information			Number in Service	DSG 1000 Ldgs	ESG 1000 Ldgs	WFD Audit Completion Date	Number of Airplanes In Each Category			Models
	CERT DATE	PAX	MTOGW 1000lb.					A >100% D/ESG	B >75% D/ESG	C >50% D/ESG	
B767	Jul-82	210	315	663	50	N/A	NP	0	0	28	-100,-200,-300
B757	Dec-82	185	250	780	50	N/A	NP	0	0	4	
BAe146	Feb 83	90	84	315	50	N/A	NP	0	0	2	
A310	Mar-83	275	291	251	40	N/A	NP	0	0	4	
F100	Nov-87	107	98	276	90	N/A	NP	0	0	0	
A320	Feb-88	150	150	584	48	N/A	NP	0	0	0	
MD11	Jul-90	320	602	167	20	N/A	NP	0	0	0	
A340	Dec-92	440	567	115	20	N/A	NP	0	0	0	
A330	Oct-93	440	467	61	40	N/A	NP	0	0	0	
A321	Dec-93	220	183	75	48	N/A	NP	0	0	0	
MD90	Nov -94	172	156	59	60	N/A	NP	0	0	0	-30
B777	Apr 95	300	650	89	44	N/A	NP	0	0	0	
A319	Apr-96	145	141	45	48	N/A	NP	0	0	0	
Gulfs- V	Apr 97	19	90.5	30	40 FH	N/A	NP	0	0	0	
Bom GE	Aug 98	19	93.5	0	15	N/A	NP	0	0	0	
F70	Oct 94	80	85	15	90	N/A	NP	0	0	0	

NP — None Planned at this time

9.2 LEAD TIME ISSUES FOR TERMINATING ACTIONS

9.2.1 Introduction

During operator presentations to the Authorities Review Team (ART) at Gatwick, England in March 1998, the AAWG was asked to provide additional information to help with the understanding of issues surrounding lead time for modifications (e.g. parts, planning, etc.) that operators need prior to implementing terminating actions.

9.2.2 Discussion

Since a Monitoring Period is an integral element of the AAWG s recommendations for the evaluation and safety management time during which MSD/MED may occur in the fleet, it is important to understand the necessary planning factors that operators will face prior to accomplishing terminating actions.

To illustrate the impact on the operators, a hypothetical narrow-body fuselage lap joint modification scenario will be used. For this case, it is assumed that small MSD cracks have been experienced in high time airplanes during an implemented monitoring period. The operator impact for anticipated terminating action for a scenario such as this, would be approximately 10,000 hours labor, and up to 40 days out-of-service time for each airplane. For a major carrier, with a large fleet of airplanes, the operational impact would be very significant. For one operator s fleet of 74 airplanes, this equates to over 8 years cumulative time to accomplish airplanes at a single airplane rate, which coincides to a typical HMV or D-Check cycle. Any faster accomplishment would place the terminating action out of phase with normal heavy maintenance visits, and would result in a large number of flight cancellations. Flight cancellations would also occur if the work were scheduled at the normal HMV rate, since the elapsed time would be extended approximately two weeks. Since HMV s are usually scheduled in succession, without gaps, a domino effect on flight cancellations occurs once planned down times are interrupted.

Terminating action for typical fuselage lap joints would require the manufacture of long curved panels, used to replace the original joints. The length required for full skin joint replacement may be beyond normal raw stock sizes, and special mill-runs could be required. Special tooling is often required to contour panels within specified tolerances, using manufacturing processes beyond the capability of most operators. Lead times for the manufacture of such parts can easily require 9 to 12 months. Additional preparation involves facilities, work platforms, jacks, contour shoring for airplane jig position support, and training of sheet metal technicians to perform the work (difficult thin sheet riveting). And lastly, since the labor required to perform such a modification could exceed industry capacity, additional technicians (mechanics), inspectors, work schedulers, materiel planners and Liaison Engineers would have to be hired, or alternatively work out-sourced to a

mod center. During this planning and implementation period, as many as 20,000 additional flight cycles could accrue on the fleet, which must be accounted for in the WFD estimate. Alternatively, work would have to begin on airplanes well below the identified MSD/MED threshold, to meet proposed compliance times.

One other consideration is validation of the proposed terminating action. In the cited demonstrative case, several repair and modification scenarios are envisioned. Each would require extensive full-scale fatigue testing to avoid future service actions on the part of the operators.

9.2.3 Structures Task Group Process

For the fuselage lap joint example cited to illustrate lead-time issues, the following operator concerns should be addressed through the Structures Task Group operator-OEM advisory process:

- A summary of the fleet data and metallurgical data gathered from typical excised cracks, forwarded by operators to the OEM, should be made available to other operators and FAA
- Crack growth curves for the MSD condition should be made available to the operators and FAA
- Advance copies of any modification service bulletin should be made available to the operators as soon as possible to allow the operator planning process to proceed
- SRM revisions to cover FAA approved repair configuration should be readied
- OEM should provide preformed (contoured and curved) modification parts through a equalitarian distribution process
- Service bulletins should include instructions on the logistics of accomplishing specific repairs (specific shoring recommendations, other structural components that can be removed, what other types of simultaneous maintenance activity can be performed concurrently with the modification)
- Faying sealant with long cure times should be utilized to allow installation time without premature curing/hardening of the sealant
- Specific manufacturing process instructions for forming parts should be provided by the OEM
- Service bulletins for terminating action for airplanes under threshold should also be provided to preclude the potential for more substantial future work
- Specific instructions for door opening interfaces with modification parts should be provide in any service action on fuselage lap joints
- Access/removals of electrical systems such as circuit breaker or instrument panels must also be addressed to allow adequate access to the crown area in the forward fuselage area

- Previously repaired joints must also be dispositioned (damage tolerance evaluation supported by fatigue test)
- Aerodynamic performance penalties associated with the installation of protruding head fasteners and external modification parts entire length of fuselage at multiple joints, and effects on airplane stall measurements and characteristics (if fuselage drag is significant) must also be addressed prior to release of terminating action including these design features
- Compliance recommendations should be quantified for differences in fatigue crack initiation and crack growth between different airplane models, i.e. passenger and freighter models.
- Industry facility and skilled personnel capacity should also be evaluated in determining compliance times.
- Compliance times should also consider existing operator scheduled maintenance visits
- Terminating action plans should include compliance flexibility
- OEM compliance recommendations should be based on actual fleet service data
- Compliance times should be implemented for different zones of the fuselage based on stress severity if applicable to support packaging of work
- Long term durability of the terminating action should accurately replicate service conditions with full scale fatigue test

Special task oriented working committees comprised of the airline representatives and OEM should be utilized to discuss lead time and planning complex issues associated with WFD terminating actions.

9.2.4 Summary

A safety management program example using a hypothetical narrow-body fuselage lap joint MSD/MED problem has been used to illustrate potential lead time and planning issues. It is anticipated that approximately 12 months may be necessary to resolve all planning issues associated with terminating action for such a fleet scenario. Any significant WFD terminating action must allow significant planning time for operators and OEM s to resolve the myriad of anticipated (and typical) problems highlighted in the previous section.